Name:

ID:

CSCI 3104, Algorithms **Profs. Chen & Grochow**
Quiz 9 Q1 S18 **Spring 2020, CU-Boulder**

Instructions: This quiz is open book and open note. You **may** post clarification questions to Piazza, with the understanding that you may not receive an answer in time and posting does count towards your time limit (30 min for 1x, 37.5 min for 1.5x, 45 min for 2x). Questions posted to Piazza **must be posted as PRIVATE QUESTIONS.** Other use of the internet, including searching for answers or posting to sites like Chegg, is strictly prohibited. Violations of these grounds to receive a 0 on this quiz. Proofs should be written in **complete sentences. Show and justify all work to receive full credit.**

Standard 18. Suppose we have n stairs, which we label $s_1, \ldots, s_k$. Each stair s_k has a number $a_k \geq 1$ associated to it. At stair s_k, you may jump forward i stairs, where i is any number $1 \leq i \leq a_k$. Your goal is to count the number of ways to climb the stairs. Note that your starting position is on stair s_1.

Is there a clear recursive structure in the problem that would be useful in designing an effective dynamic programming algorithm? That is, is dynamic programming a useful algorithmic technique for this problem? Clearly justify your answer.

Solution: Suppose we are at stair 1. Choosing to jump i stairs forward (where $1 \leq i \leq a_1$) yields a smaller instance of the problem with $(n - i + 1)$ stairs.